

Big Island Solar Water Heaters

Analysis of Sizing, Costs, and Customer Satisfaction

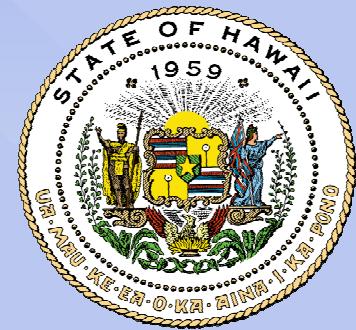
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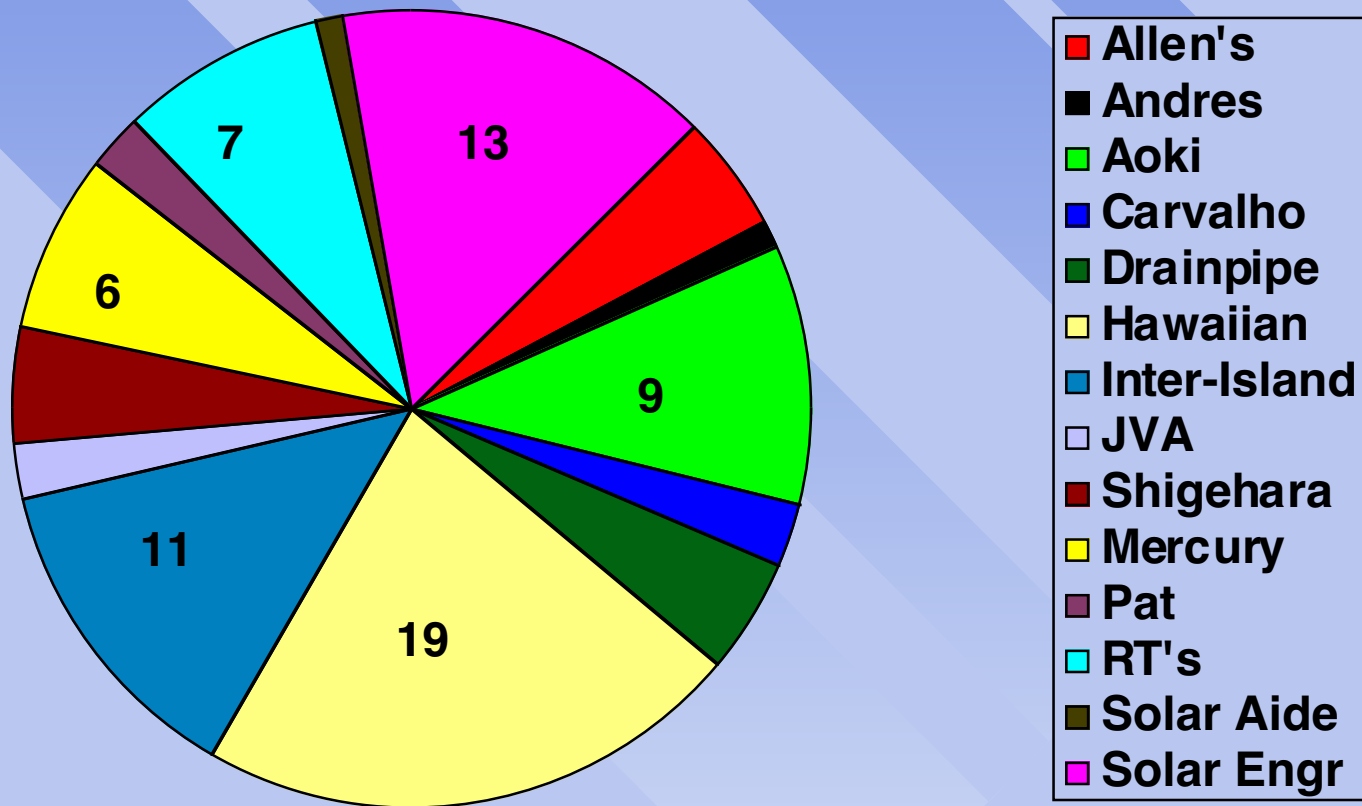
Na Makani Low-Cost Solar Water Heating Program

- **A Rebuild Hawai'i Project**
- **\$37,000 from USDOE through DBEDT**
- **Contractor: Plan To Protect, Inc.**
- **Subcontractor: Na Makani Energy Initiative**
- **August 1, 2000 through July 31, 2002**
- **Target: 100 SWH installations**

Project Objectives

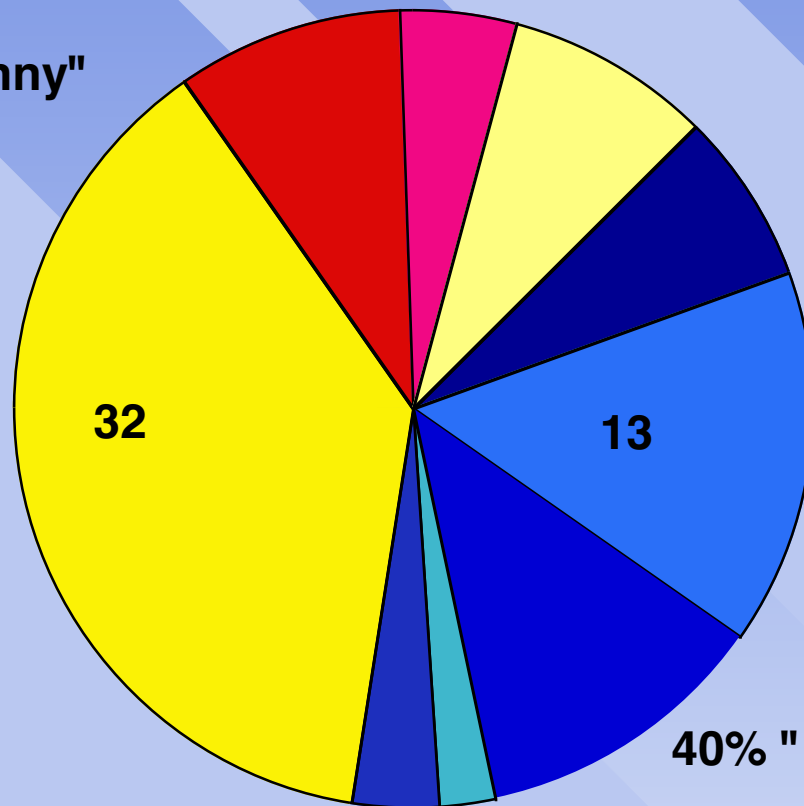
- **Original: Low-Cost SWH using existing tanks, recycled collectors in N. Kohala**
- **Revised: Expanded to entire Island of Hawai'i, included new systems**
- **Data collected: solar contractor, system cost, utility bills, household size, tank and collector size, geographic location, unusual activities, satisfaction**

14 Participating Contractors

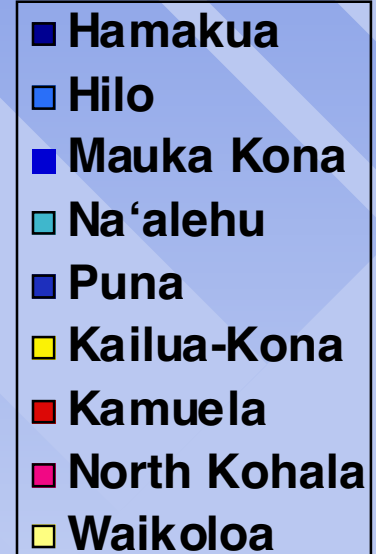


Location of Installations

60% "Sunny"



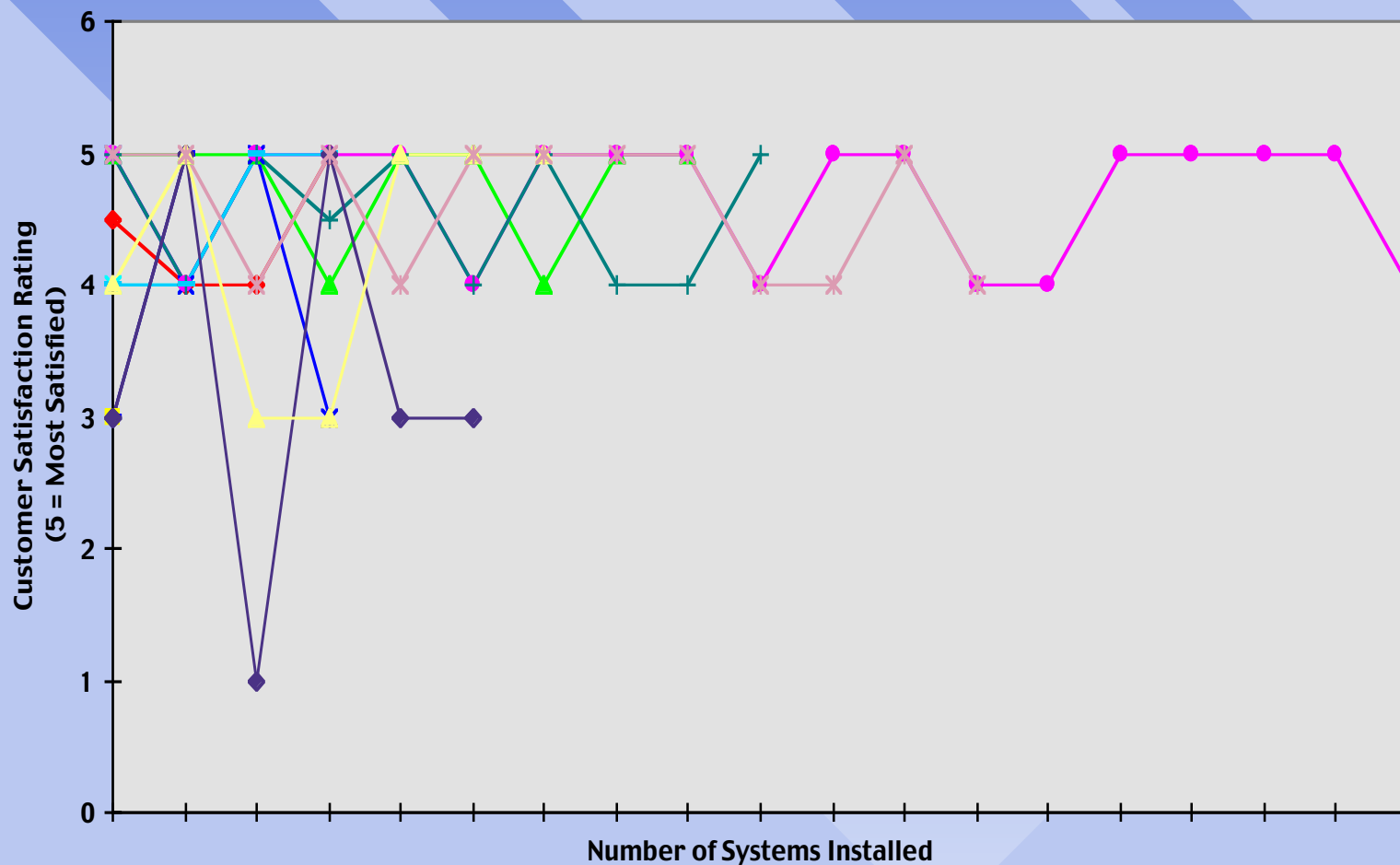
40% "Cloudy"



Customer Satisfaction

- **Rated on 0-5 scale (5 is highest)**
- **Satisfaction ratings for:**
 - **Installer—Average 4.43**
 - **Solar System—Average 4.67**
 - **Na Makani Program—Average 4.79**
- **General comments also noted**

Satisfaction with Installer



Comments on Installers

■ Positive Comments

- About 2 dozen remarks
- “Professional”
- “Good follow-up”
- “Excellent workmanship”
- “Friendly”
- “Great job”
- “Worked very hard”

■ Critical Comments

- About 2 dozen remarks
- “No follow-up”
- “Leaks”
- “Messy”
- “Slow”
- “Incomplete”
- “Need more info — how to run system”

Other Comments

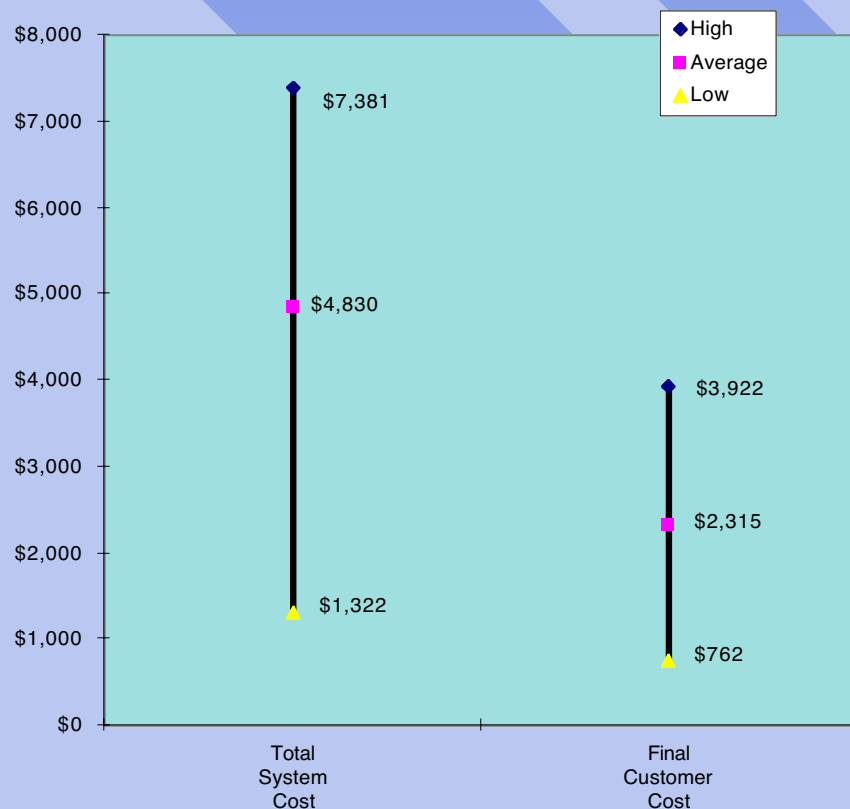
■ Positive

- plenty of hot water
- bill decreased significantly
- helping environment
- supports more government incentives, policies & programs

■ Critical

- not enough hot water
- savings not as much as hoped
- water scalding toddler
- community association rules prevented rooftop tank

Wide Range in System Costs



■ Total System Cost

- high: \$7,381
- average: \$4,830
- low: \$1,322

■ Final Customer Cost

- high: \$3,922
- average: \$2,315
- low: \$762

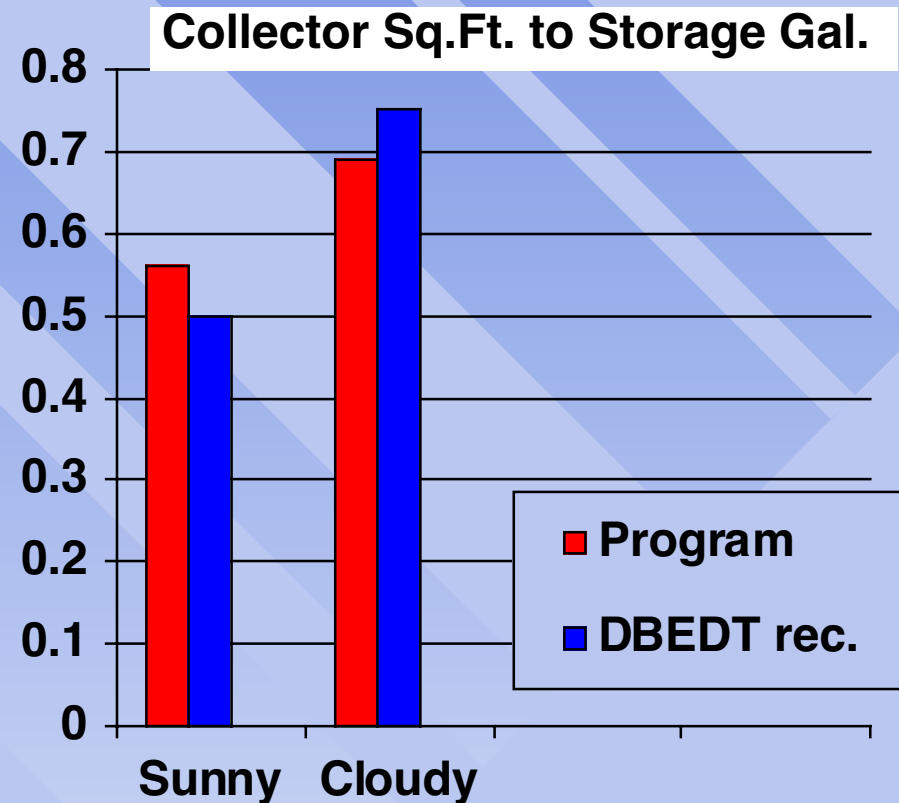
Wide Range of Unit Costs

- **Analyze cost in dollars per unit**
 - square foot of collector
 - gallon of storage
- **Reduces differences based on system size**
- **Still a wide range**



System Sizing

- **90% have between 20-40 gallons per person in storage (DBEDT rec.)**
- **2 systems undersized**
- **6 systems oversized**
- **Fairly consistent sizing of collector to storage volume**



Savings over 15 Years

- **Aggregate: $\geq 4,865$ barrels of oil**
- **Aggregate: $\geq 2,661,000$ kWh**
- **Per Customer:**
 - **High: \$16,813**
 - **Most Probable: \$2,000 - \$6,000**
 - **Low: marginal, if any**
- **Data Limitations: 2 months before/after**

Life Cycle Cost Analysis

- **BLCC software from FEMP, 4/1/02**
- **Assumed SWH systems were financed**
 - **5.6% discount rate**
- **Assumed HELCO rates at \$0.185/kWh**
 - **drop in 2002, 2003, 2004**
 - **then rise ~ 2%/year**
- **Assumed OM&R minimal**

Life Cycle Cost Results

■ LCC Only for Retrofits

- 57 of 85 systems
- not new construction (no “before” data)
- not “energy services” installations
- 18 systems —33%— little or no savings
- 3 bills increased — probably weather related
- 6 systems apparently oversized

■ Solar Saves ~ 22% of Electric Bill

Lessons Learned

- **Customers are happy**
- **Customers are not shopping around**
- **Installers can improve, especially communication with customer**
- **Some happy customers may not be “best” solar owners**
- **Motives: savings, environment, politics**
- **Take data for longer period**

Questions?

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